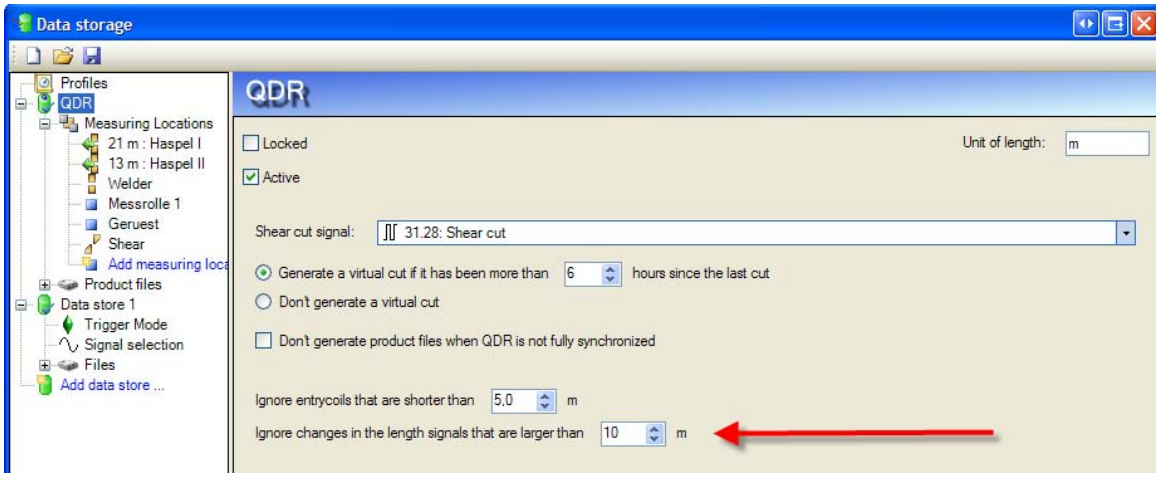
New features in QDR v6.14.0

Length signals

The length signals that QDR receives from the tracking system are filtered. This filtering is needed to handle reversing. It is also needed to handle timing differences between the coil ID change and the length signal reset.

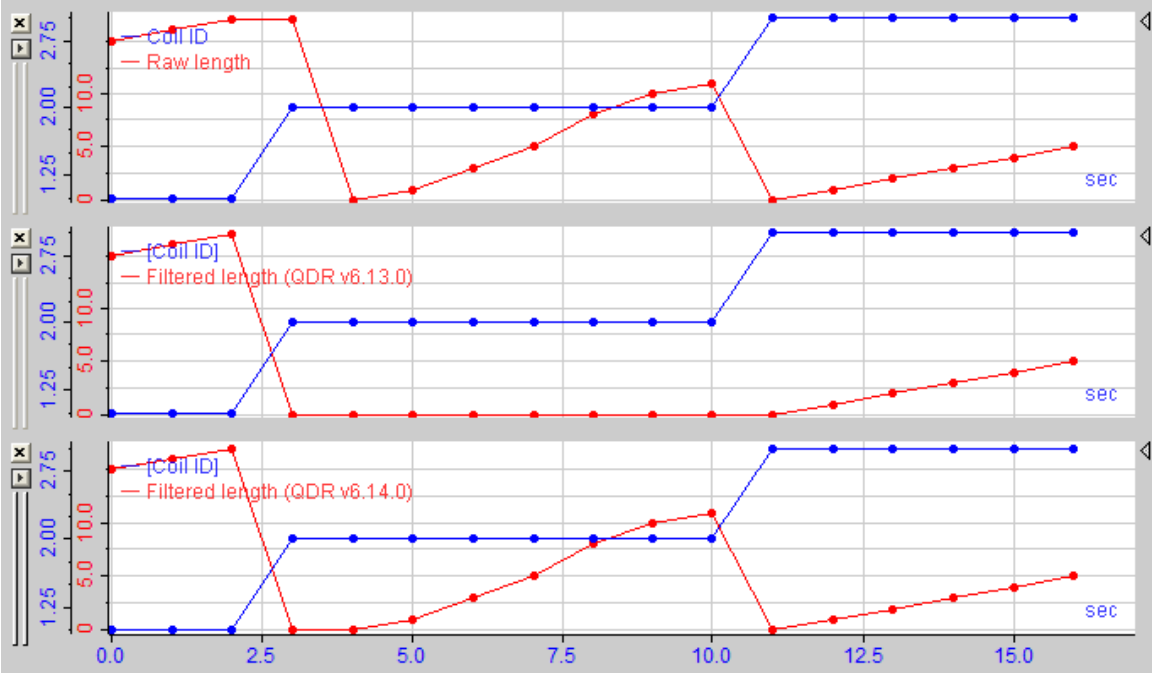
In QDR versions before v6.14.0 the filtering was done by taking the length signal value at the coil ID change as the length reference value. The filtered value was the actual length signal minus the length reference value. This approach required that the length signal was reset before or at the coil ID change. If the length was reset after the coil ID change then the filtered length would remain constant at 0 for this coil ID.

In QDR v6.14.0 the filtering is done differently. There is no length reference value taken. At the coil ID change the filtered length is set to 0. It then increases with the increases in the length signal. If the change in length is larger than MaxLengthDelta then this change is ignored. MaxLengthDelta is 10m by default. You can change it in the datastore configuration dialog.



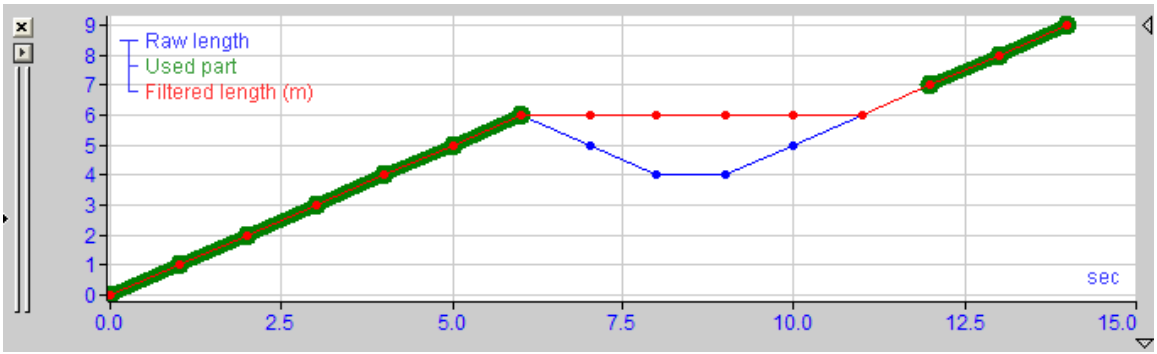
The new method can now also handle a length signal reset that comes after the coil ID change.

The following picture shows the raw length signal and coil ID signal and the resulting filtered length signals for the old and the new filtering method.

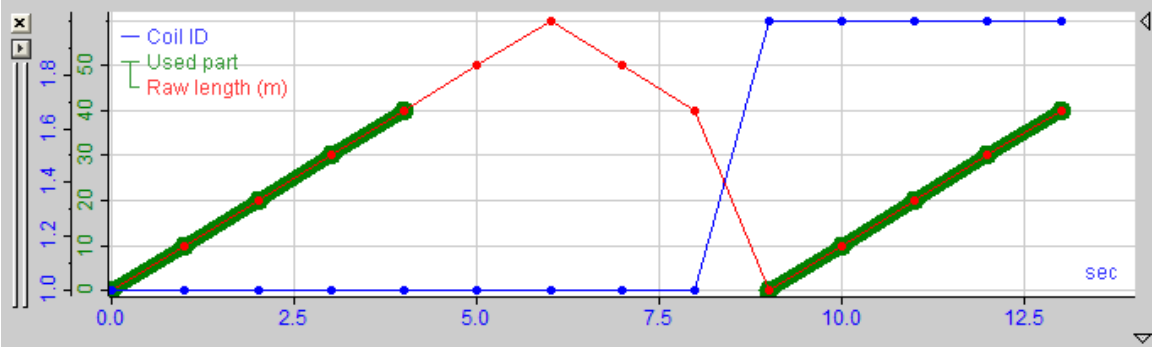


Reversing

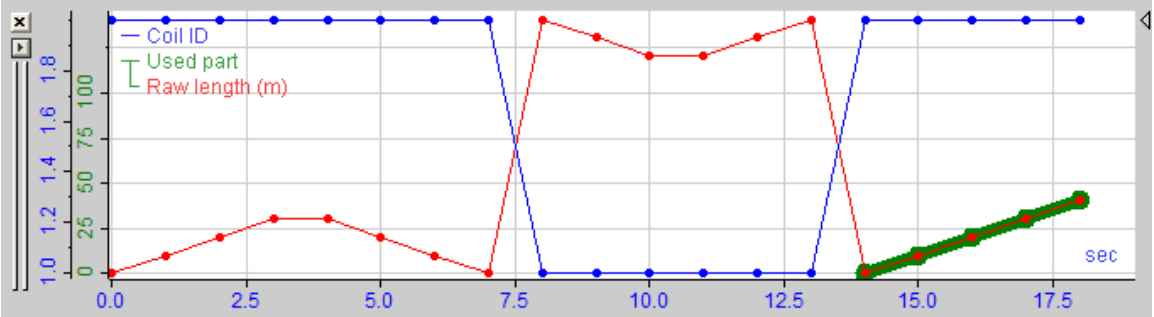
If a coil is being reversed then the raw length signal will decrease. The filtered length signal will not decrease it will stay at the maximum value. If the coil goes back forward then the raw length signal increases again. When the raw length signal becomes larger then its previous maximum then the filtered length signal will also start to increase.



It can happen that a coil is reversed and a piece of it is cut. The coil length at the ID change will then be smaller than the previous maximum length. QDR will recognize this and the samples for the missing meters will be removed. In the following example the coil was 60m long then it was 20m reversed and cut. A new coil with ID 2 is then welded to it. QDR will now have an entrycoil with ID 1 of 40m.



The reversing can become more complicated if a coil is completely reversed out of the system. The following example shows such a situation.

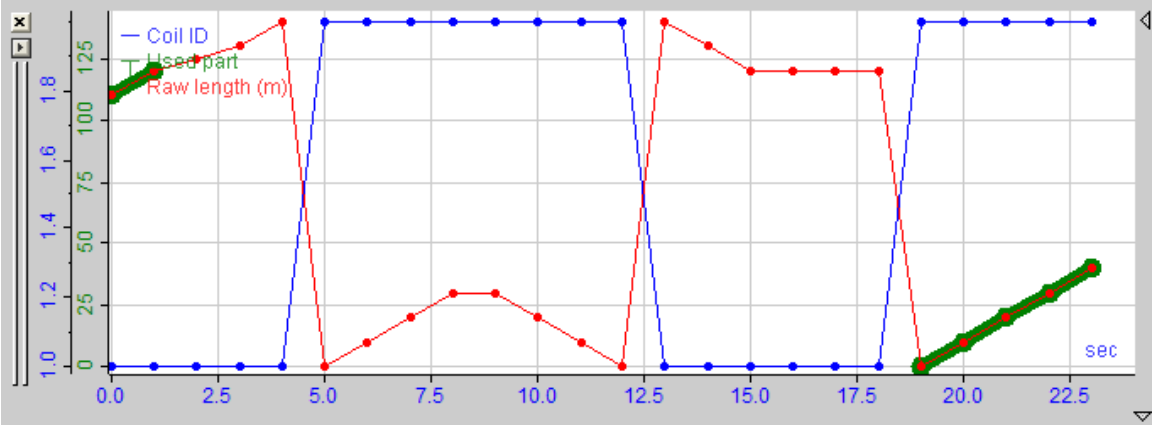


Coil 2 enters the system and advances to 30m. It is then reversed back out. At this point the entrycoil file for coil 2 is closed. The total coil length will be 0 because it reversed completely out. Entrycoils that have a length that is smaller then MinEntrycoilLength (default = 5m) are removed from QDR. So the entrycoil file for coil 2 is removed.

The line is reversed further so that coil 1 appears again at this measuring location. It starts at its endlength of 140m and reverses back to 120m. Coil 1 then goes forward again to 140m. The filtered length for coil 1 will be 0m. So this entrycoil file will also be removed.

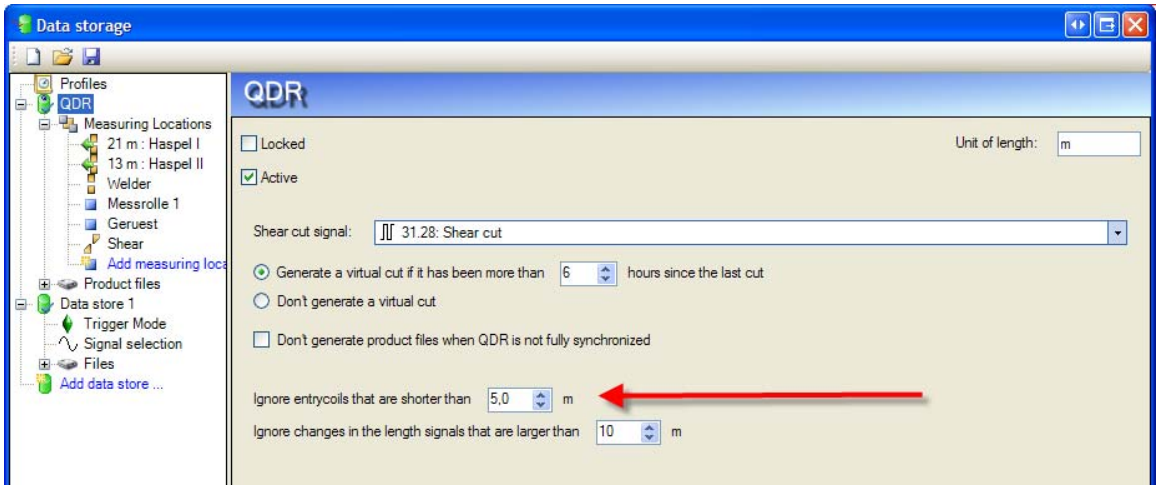
Coil 2 then re-enters the system. A new entrycoil file is generated and this one will be used. This part is shown in green in the picture.

There is one more situation that can happen.



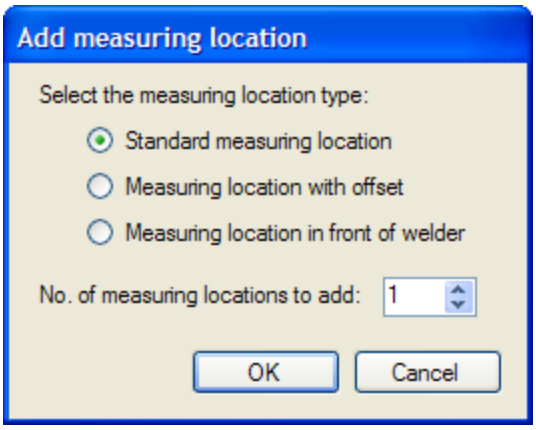
Coil 2 enters the system and is reversed completely out. Coil 1 is reversed for 20m and then cut. The Coil 2 enters again. QDR will have removed the first file for coil 2 and the second file for coil 1. It will also have noticed that coil 1 was cut so it will remove 20m from the first file for coil 1. The green in the picture show the data that will be used for coils 1 and 2.

The value for MinEntrycoilLength can be set in the datastore configuration dialog:



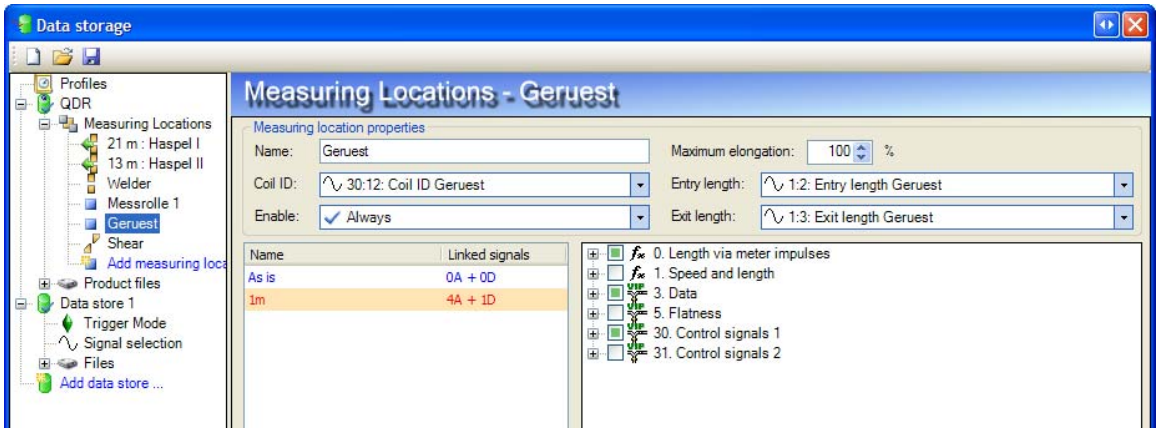
New types of measuring locations

When you click the “add measuring location” node in the datastore configuration dialog you will get a small wizard.



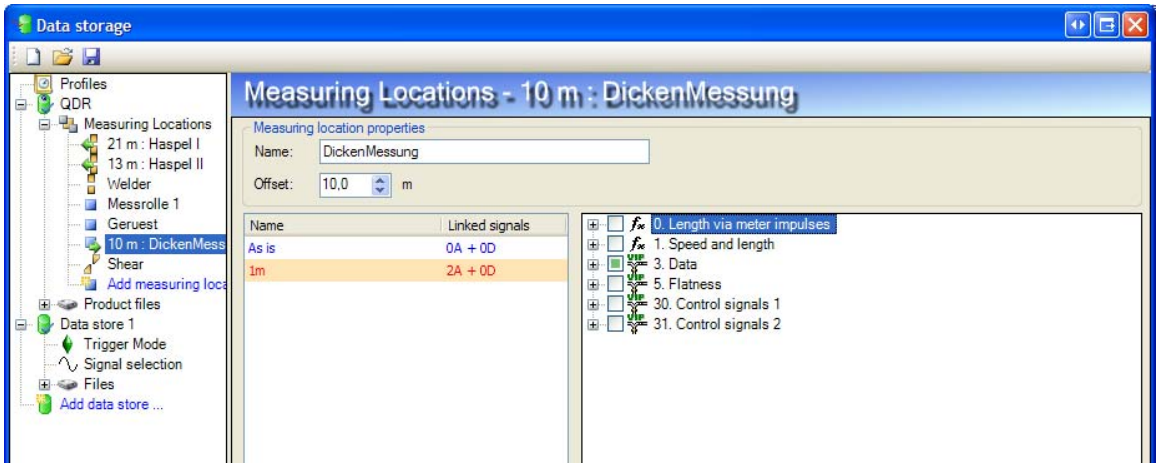
There exist 3 types of measuring locations in QDR v6.14.0:

Standard measuring location



This is a normal measuring location that requires a coil ID signal, length signal(s) and optionally an enable signal. This measuring location supports elongation by specifying different entry and exit length signals. You can specify the estimated maximum elongation at this measuring location. This estimation is used to determine the length resolution that is required at this measuring location to get a 1m resolution in the product file.

Measuring location with offset

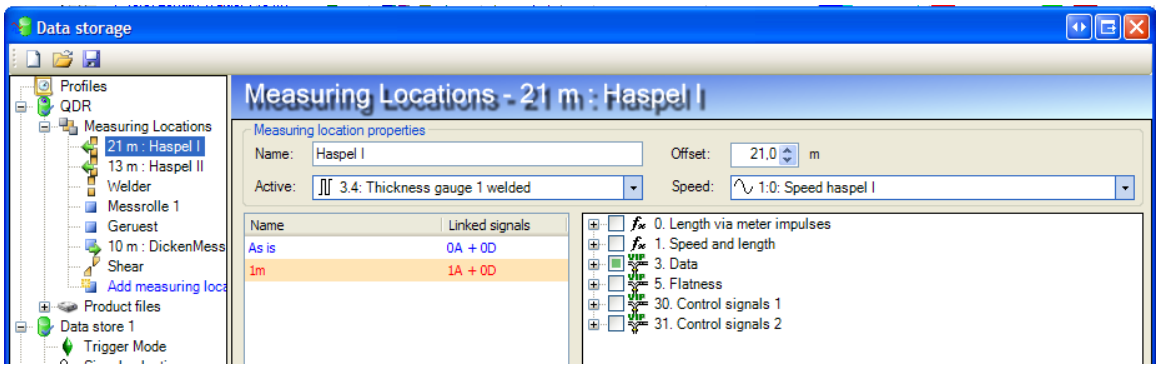


You only need to specify an offset to the parent measuring location. The parent measuring location is the standard measuring location in front of this one. Multiple measuring locations with an offset can have the same standard measuring locations as their parent. The measuring locations are automatically ordered by their offsets.

These measuring locations don't support elongation. The coil ID and the length signal are generated automatically by QDR. These signals are length-delayed versions of the parent coil ID and exit length signals. If the parent measuring locations is disabled then all its child measuring locations are also disabled.

The advantage of this type of measuring location is that you don't have to provide coil ID and length signals for them.

Measuring location in front of welder



This type of measuring locations is used to support thickness gauges and other measurement devices that are placed in front of the welder. Normally the tracking starts at the welder. So when a coil passes these measuring locations QDR doesn't know to which coil the data belongs. It is only when the coil reaches the welder that it gets an ID and that the length signal becomes valid.

In order to handle these measuring locations QDR needs 3 things per location:

- the offset to the welder
- An active signal that is TRUE when the measuring location is coupled to the welder. This means that the coil is welded at the welder.
- A speed signal that gives the speed of the coil at the measuring location when it is not coupled to the welder. This speed can be calculated from the coiler speed.

QDR uses the coil ID and length signal of the welder to generate entrycoils. It creates length-delayed versions of the signals that need to be measured at this location. The length-delayed signals are created by using the speed signal if the active signal is FALSE and by using the welder length signal if the active signal is TRUE.

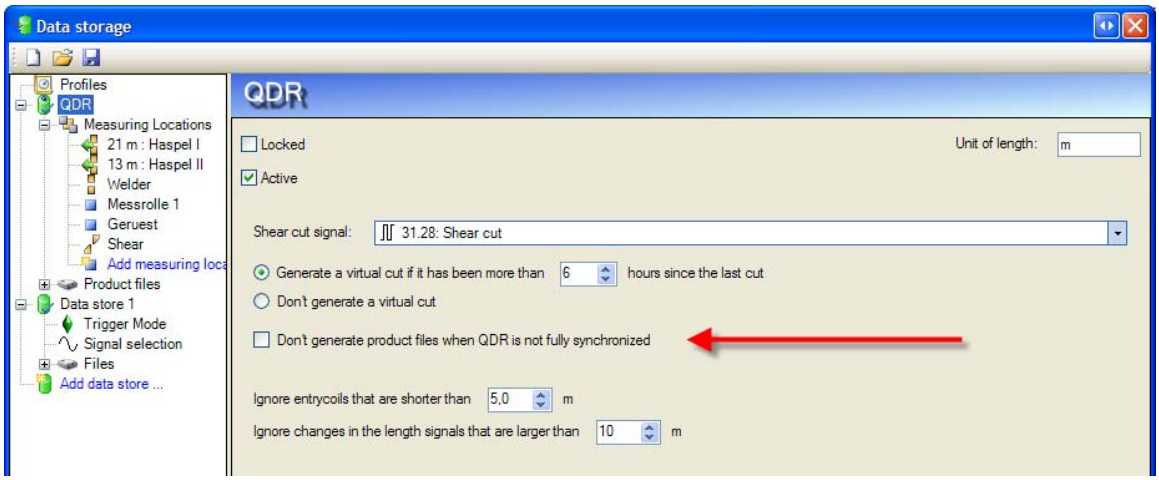
A complete entrycoil is either active or inactive at a specific measuring location in front of the welder. The active signals of all measuring locations in front of the welder are sampled when the welder length signal goes above 0.5m. If an entrycoil is not active for a measuring location then all its signals will have a gap with the same size of the entrycoil in the productcoil file.

Automatically bypassing measuring locations

In some systems certain measuring locations can be bypassed. QDR supports this through the use of an enable signal on the standard measuring location. The enable signals of all measuring locations are monitored for changes. When a change is detected and it remains constant for at least 2 seconds then the QDR datastore is stopped. It is then automatically restarted with the new configuration.

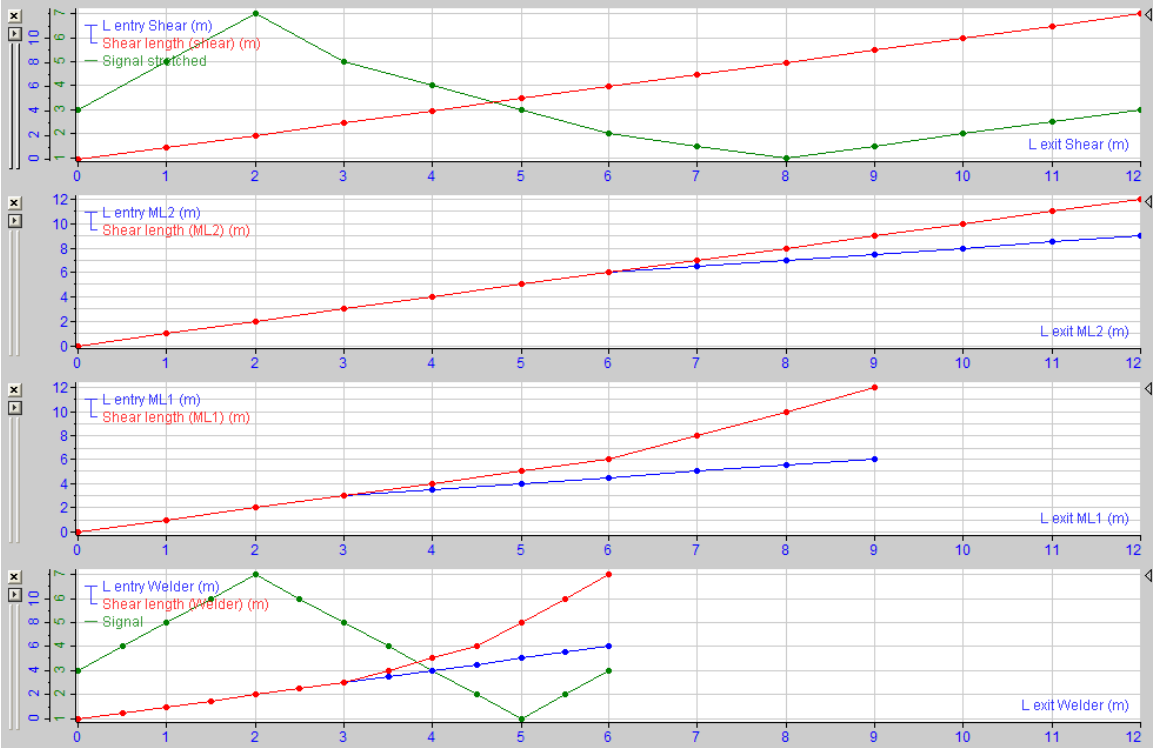
Product file generation

QDR generates a product file when a 0 to 1 transition is detected on the cut signal. If a cut comes when QDR is not completely synchronized then there will be some data missing at some measuring locations. If data is missing then these measuring locations won’t have data in the product file. The product file will then contain the infofield $QDR_DataMissing with a value of 1. If QDR is not synchronized then the infofield $QDR_NotSynchronized with a value of 1 will be written in the product file.



You can set an option that QDR only generates product files when it is completely synchronized. In that case all data at all measuring locations should be available (if the length signals are correct). QDR is synchronized when an ID change (e.g. from ID 1 to ID 2) has been tracked from the welder to the shear.

The lengthbased data in the product file is stretched to the length at the shear. This stretching was done uniformly in QDR versions before 6.14.0. In 6.14.0 the stretching is done dynamically via the shearlength signal. This signal is created at the shear. It goes from 0 to the end length of the product coil at the shear. QDR goes through all measuring locations starting at the shear and ending at the welder. If a measuring location has different entry and exit length signals then the shearlength signal is stretched via the entry length signal. So that the shearlength signal always shows the length at the shear in relation to the exit length at the current measuring location. The following graphs give an example.



The product coil is 12m. The first graph shows the length signals at the shear.
The next graph shows the situation at ML2. The first 6m there was no elongation at ML2. The last 6m there was a 100% elongation. So the coil was 9m at the entry of ML2 and 12m at the exit. The graph shows the entry length signal plotted on the exit length. The shear length signal is the same as at the shear because QDR always uses the exit length to sample the data at a measuring location.

The third graph shows the situation at ML1. The exit length goes to 9m here. When we do an X/Y plot of the shear length signal at ML2 with the entry length at ML2 then we get the shear length at ML1. The shear length has an inclination of 1 for the first 6m and then it gets an inclination of 2 for the last 3m. There is additional elongation at ML1. The first 3m there is no elongation then the last 6m there is 100% elongation. You can see this at the L entry ML1 signal. The coil was 6m at the entry of ML1 and 9m at the exit.

The fourth graph shows the situation at the welder. The exit length goes to 6m here. The shear length signal is the result of an X/Y plot of the shear length signal at ML1 with the entry length at ML1. The first 3m there was no elongation so we get an inclination of 1. The next 1.5m there was 100% elongation at ML1 so we get an inclination of 2. The last 1.5m there was 100% elongation at ML1 and 100% elongation at ML2 so we get a total elongation of 200% and an inclination of 4. The green signal is a signal we sampled at the welder. QDR will now use the shear length signal at the welder to stretch the green signal to the product coil length. You can see the result in the first graph.

QDR expects that the exit length of a measuring location is the same as the entry length of the next measuring location. If this is not the case then QDR stretches the shear length

signal uniformly. If the length difference is more than 0.5% then an infofield is written in the dat file. The info field is called $QDR_MismatchBetweenExitAndEntryLengthAtMlx with x the measuring location index. The value of the infofield is the length difference in percent. If the difference is more than 10% then you get an error in the eventlog.